

## REMARKS

The Applicant appreciates the time taken by the Examiner to review the Applicant's present application. This application has been carefully reviewed in light of the Examiner's comments, including the Office Action mailed June 1, 2007. The Applicant respectfully requests reconsideration and favorable action in this case.

### Summary of rejections and amendments

The Examiner rejected claims 10 and 20 under 35 U.S.C. §112, second paragraph, claims 1-20 under 35 U.S.C. §101, claims 1, 2, 4, 5, 8 and 9 under 35 U.S.C. §102(b), and claims 3, 6, 7 and 11-19 under 35 U.S.C. §103(a). The Applicant has amended claims 1 and 12-19, canceled claims 10 and 20, and added new claims 21 and 22. Claims 1-9, 11-19 and 21-22 are therefore pending in the application.

### Requirement for information

The Examiner requires that the Applicant provide copies of articles not already cited in the application which are authored by Duncan and Horn, Kalman (and Bucy), Tikhonov, Philips, Joly et al., El-Jakl, et al., Twomey and Paige and Saunders. The Applicant submits herewith copies of the articles which are in the possession of the Applicant (Duncan and Horn, Kalman, Kalman and Bucy, Joly et al., El-Jakl, et al., and Paige and Saunders).

### Objections to claims

The Examiner objects to claims 11-19 because there are two claims labeled claim 11, and claims 11-19 do not refer to preceding claims. The Applicant has amended the claims beginning with the second claim 11 to renumber these claims from 11-19 to 12-20. The Applicant therefore believes the Examiner's objection has been overcome.

The Applicant notes that references herein to the claims use the current, corrected claim numbers.

### Rejections under 35 U.S.C. §112

Claims 10 and 20 are rejected under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention. The Applicant has canceled claims 10 and 20, so the rejection is moot.

### Rejections under 35 U.S.C. §101

Claims 1-20 are rejected under 35 U.S.C. §101 as being directed to non-statutory subject matter. The Applicant respectfully traverses this rejection.

The Examiner states that the claims are "considered non-functional descriptive materials that are not statutory even if in combination with a physical medium according to M.P.E.P. 2106.02 [R-5] and Interim Guidelines for 35 USC 101." The Examiner further states that "[t]he method of claim 1 and the processor software of claim 10 consist of an algorithms and contains no useful, concrete, and tangible results. (The Applicant understands the Examiner's statement to refer to claims 1 and 11, instead of claims 1 and 10.) The Applicant respectfully disagrees.

M.P.E.P. 2106.02 states that claims define nonstatutory processes if they consist solely of mathematical operations, or simply manipulate abstract ideas, without some claimed practical application. M.P.E.P. 2106 also points out, however, that "It is now commonplace that an application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection." (citing Diehr, 450 U.S. 175 at 187, 209 USPQ 1 at 8 (1981).)

In the present application, original claim 1 does not recite simply mathematical operations or manipulation of abstract ideas. Instead, it recites receiving signals corresponding to a first parameter (e.g., measured potentials from a multi-electrode probe,) performing an inversion of the received signals, and generating a mapping of a second parameter (e.g., electrical impulses at the heart muscle.) While original claim 1 is believed to provide a useful, concrete and tangible result (generating the mapping of the second parameter,) the Applicant has amended claim 1 to also include the limitation of providing this mapping to a user, which the Applicant believes provides an even more concrete and tangible (and useful) result (see M.P.E.P. 2106.)

Claim 11 likewise recites more than simple mathematical operations or manipulation of abstract ideas. Claim 11 recites a system which includes a data processor and data input and output interfaces coupled to the processor, where the processor is configured to regularize data received at the input interface and generate output data which is provided at the output interface. The system of claim 11 receives input data corresponding to a first parameter (e.g., measured potentials from a multi-electrode probe,) performs a regularization function on this data and generates output data corresponding to a second parameter (e.g., electrical impulses at the heart muscle) which is provided at the output interface of the system. By generating and providing the data corresponding to the second parameter at the output interface, the system and generates a useful, concrete and tangible result in accordance with M.P.E.P. 2106.

The Applicant notes that new claims 21 and 22 have been added. These claims recite limitations as to the display of a graphical mapping of the data corresponding to the second parameter. These limitations provide additional a useful, concrete and tangible results in accordance with M.P.E.P. 2106, so claims 21 and 22 are believed to be directed to statutory subject matter as well.

#### Rejections under 35 U.S.C. §102

Claims 1, 2, 4-5 and 8-9 are rejected under 35 U.S.C. §102(b) as being anticipated by the Joly et al. publication "Time-recursive solution to the inverse problem of electrocardiography: A model-based approach" ("Joly"). The Applicant respectfully traverses this rejection.

The Examiner states that Joly discloses all the limitations of claim 1, except the limitation "wherein the inversion is regularized by a Duncan Horn formulation of a Kalman filter." The Examiner does not give this clause patentable weight because the Examiner believes it simply expresses the intended result of the recited process step. The Applicant respectfully submits that this limitation of original claim 1 did not simply express an intended result -- regularization by a Duncan Horn formulation is not a result, but instead describes a specific way to perform the inversion. The Applicant therefore believes this limitation should have been given patentable weight by the Examiner. The Applicant has nevertheless amended claim 1 to specify that performing the inversion of the received signals includes regularized the inversion by a Duncan-Horn formulation of a Kalman filter.

As the Examiner notes in the rejection under 35 U.S.C. §103, Joly does not teach the use of a Duncan and Horn formulation of a Kalman filter, so Joly fails to anticipate claim 1. Because claims 2, 4-5 and 8-9 depend from and include the limitations of claim 1, Joly fails to anticipate these claims as well. The Applicant therefore respectfully requests that the rejection of claims 1, 2, 4-5 and 8-9 under 35 U.S.C. §102 be withdrawn.

#### Rejections under 35 U.S.C. §103

Claims 11-13, 15 and 18-19 are rejected under 35 U.S.C. §103(a) as being unpatentable over Joly in view of the Duncan and Horn publication "Linear dynamic recursive estimation from the viewpoint of regression analysis" ("Duncan and Horn"). The Applicant respectfully traverses this rejection.

As noted above, Joly does not teach the use of a Duncan and Horn formulation of a Kalman filter. The Examiner states that this shortcoming of Joly is remedied by the Duncan and

Horn reference. The Examiner, however, does not point out anything in either the Joly reference or the Duncan and Horn reference which provide any suggestion or motivation that the two should be combined. Further, the Examiner does not provide any line of reasoning supporting the combination, other than the statement that the combination would have been obvious to a person of ordinary skill "in order to provide a non-recursive regularization of the ill-posed inverse problem. The Applicant respectfully submits that this is insufficient to support a rejection under 35 U.S.C. §103.

In order to establish a prima facie case of obviousness under 35 U.S.C. §103, three basic criteria must be met. The prior art references must teach or suggest all the claim limitations, there must be some suggestion or motivation to combine the references, and there must be a reasonable expectation of success. M.P.E.P. 2143. The Applicant respectfully submits that at least two of these criteria have not been met.

M.P.E.P. 2143.01 states that "The teaching, suggestion, or motivation must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art." The Examiner has not indicated any part of the references that suggest their combination. The Examiner instead relies on the knowledge generally available to one of ordinary skill in the art and assumes that a person of ordinary skill would be motivated to find a non-recursive regularization of an ill-posed inverse problem. The Examiner, however, provides no explanation as to why a person of ordinary skill would be motivated to do so. In fact, the Applicant submits that a person of ordinary skill would be motivated not to find such a solution.

It is well known that non-recursive solutions are normally more difficult to set up and solve than recursive solutions. A person of ordinary skill would therefore be motivated not to use a non-recursive solution unless there were some other substantial benefit to doing so. In the case of using Kalman filters, the fact that one type of Kalman filter is beneficial in a system is not an indication that another type of Kalman filter (e.g., a, Duncan and Horn formulation) will be beneficial, or even that the second type of filter will work. (See the attached declaration of Dr. Michael E. Lisano.) At a minimum, a course of investigation of the new type of filter would have to be undertaken to determine whether it would work. (Id.) As set forth by Dr. Lisano in his declaration, even an expert with considerable experience in applying Kalman filters to a wide range of problems would not find it obvious that any particular type of Kalman filter would be effective for the desired application. (Id.) If an expert in the art of the invention would not find

the use of a Duncan and Horn formulation obvious, the Applicant respectfully submits that a person of ordinary skill would not find it obvious either.

The Applicant therefore respectfully submits that a person of ordinary skill in the art would have neither a motivation to combine the Joly and Duncan and Horn references, nor an expectation of success in combining the references. As a result, the Applicant does not believe the Examiner has established a prima facie case of obviousness in accordance with M.P.E.P. 2143. The Applicant therefore requests that the rejection of claims 11-13, 15 and 18-19 under 35 U.S.C. §103 be withdrawn.

Claims 3, 6, 14 and 16 are rejected under 35 U.S.C. §103(a) as being unpatentable over Joly in view of Duncan and Horn, and further in view of U.S. Patent No. 6,939,309 ("Beatty"). Claims 7 and 17 are rejected under 35 U.S.C. §103(a) as being unpatentable over Joly in view of U.S. Patent No. 6,214,019 ("Manwaring"). The Applicant respectfully traverses these rejections.

Each of claims 3, 6, 7, 14, 16 and 17 includes the limitation of regularization using a Duncan-Horn formulation of a Kalman filter. As explained above, the use of one type of Kalman filter in a prior art system does make it obvious to use a Duncan-Horn formulation of a Kalman filter in such a system. The cited references do not disclose or suggest to a person of ordinary skill any motivation to use a Duncan-Horn formulation, nor do they provide any expectation of success in making such a combination. The references therefore fail to support a rejection under 35 U.S.C. §103 as required by M.P.E.P. 2143. Accordingly, the Applicant respectfully requests that the rejection of claims 3, 6, 7, 14, 16 and 17 under 35 U.S.C. §103 be withdrawn.

#### Conclusion

The Applicant has now made an earnest attempt to place this case in condition for allowance. Other than as explicitly set forth above, this reply does not include an acquiescence to statements, assertions, assumptions, conclusions, or any combination thereof in the Office Action.

For at least the foregoing reasons, the Applicant respectfully requests allowance of all claims pending in the application. The Examiner is invited to telephone the undersigned at the number listed below for prompt action in the event any issues remain.

The Applicant hereby petitions for a one-month extension of time for the filing of this response. The appropriate fee is submitted herewith. If any additional extensions of time are necessary to prevent the above referenced application from becoming abandoned, the

Applicant hereby petitions for such extensions. If any fees are inadvertently omitted, or if any additional fees are required, or if any amounts have been overpaid, please appropriately charge or credit those fees to Deposit Account No. 50-3085 of the Law Offices of Mark L. Berrier.

Respectfully submitted,



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